

DDR SDRAM

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DDR Ready to Take-off

DDR wins in PC & Non-PC system segments



2000



2001



2002 & Beyond

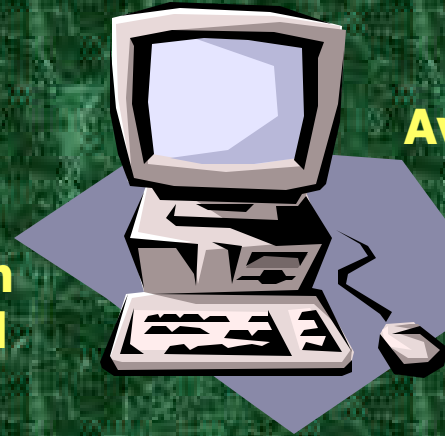


DDR Market Opportunities



Reliability

Scalable I/O configuration
support ECC and Chip Kill

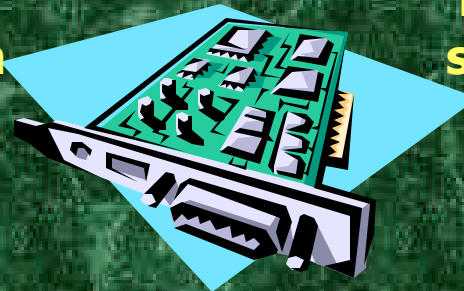


Availability

Low cost
manufacturing in
terms of package,
test and yields



Low power consumption
2.5V signaling



High bandwidth w/
source synchronized
scheme

High Availability for DDR

ELPIDA

HYUNDAI

IBM

Infineon
technologies

Micron

Mitsubishi

MOSEL VITELIC
The Memory Specialists

NANYA
TECHNOLOGY

SAMSUNG

TOSHIBA

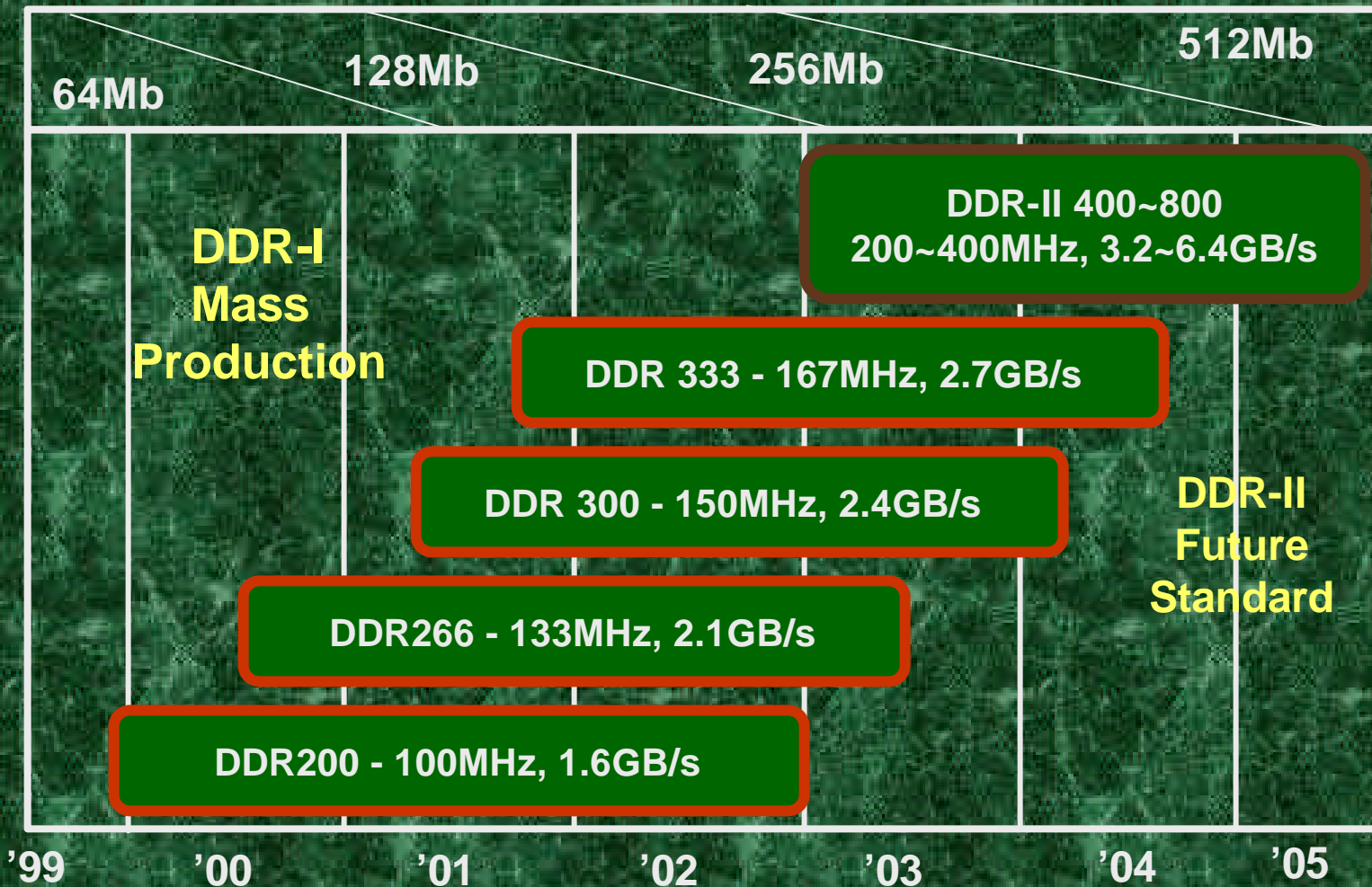
THE VANGUARD GROUP

Winbond
Electronics Corp.

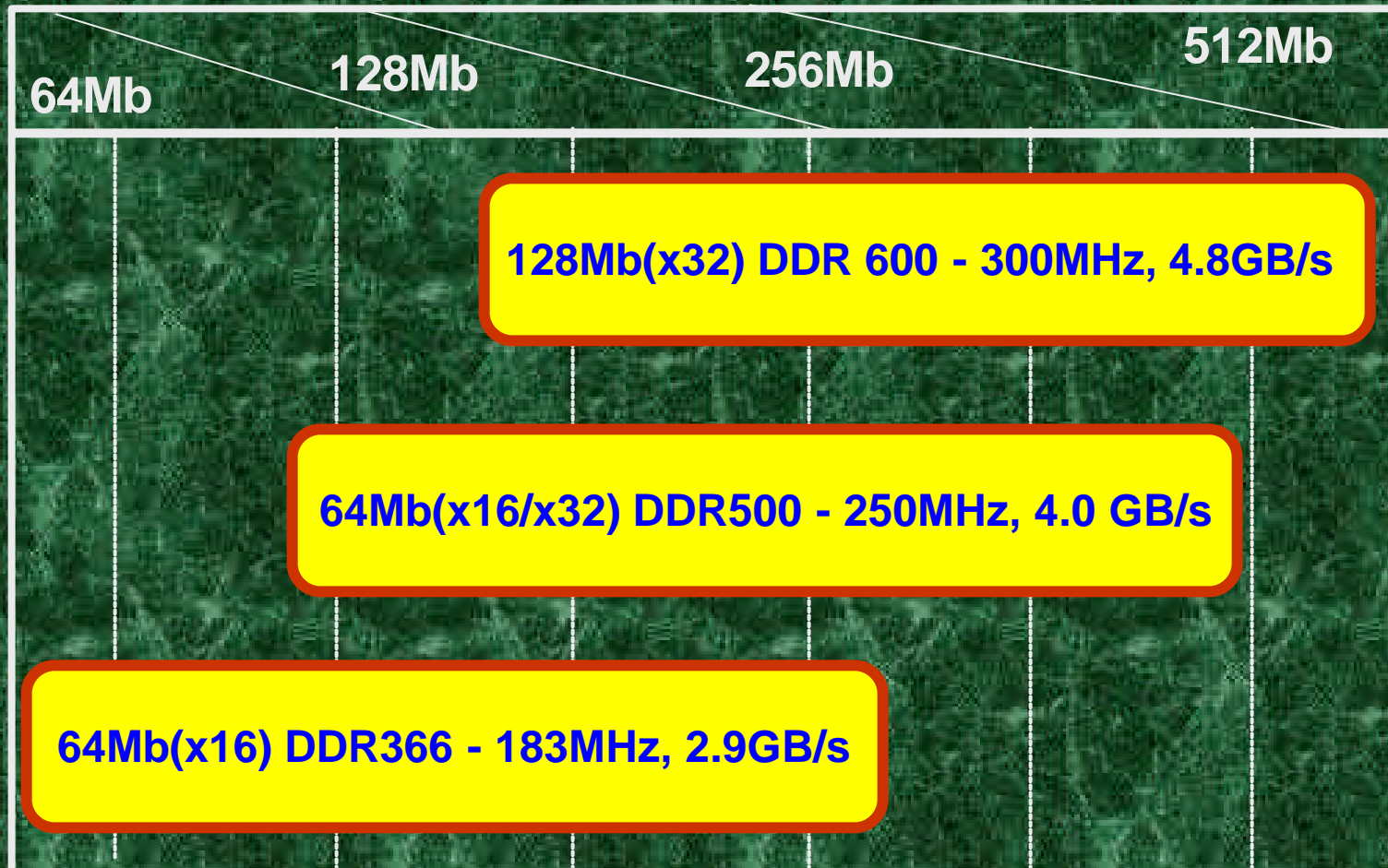
Platform
Conference

HYUNDAI

DDR Performance Path Migration



Point to Point DDR Performance



'99

'00

'01

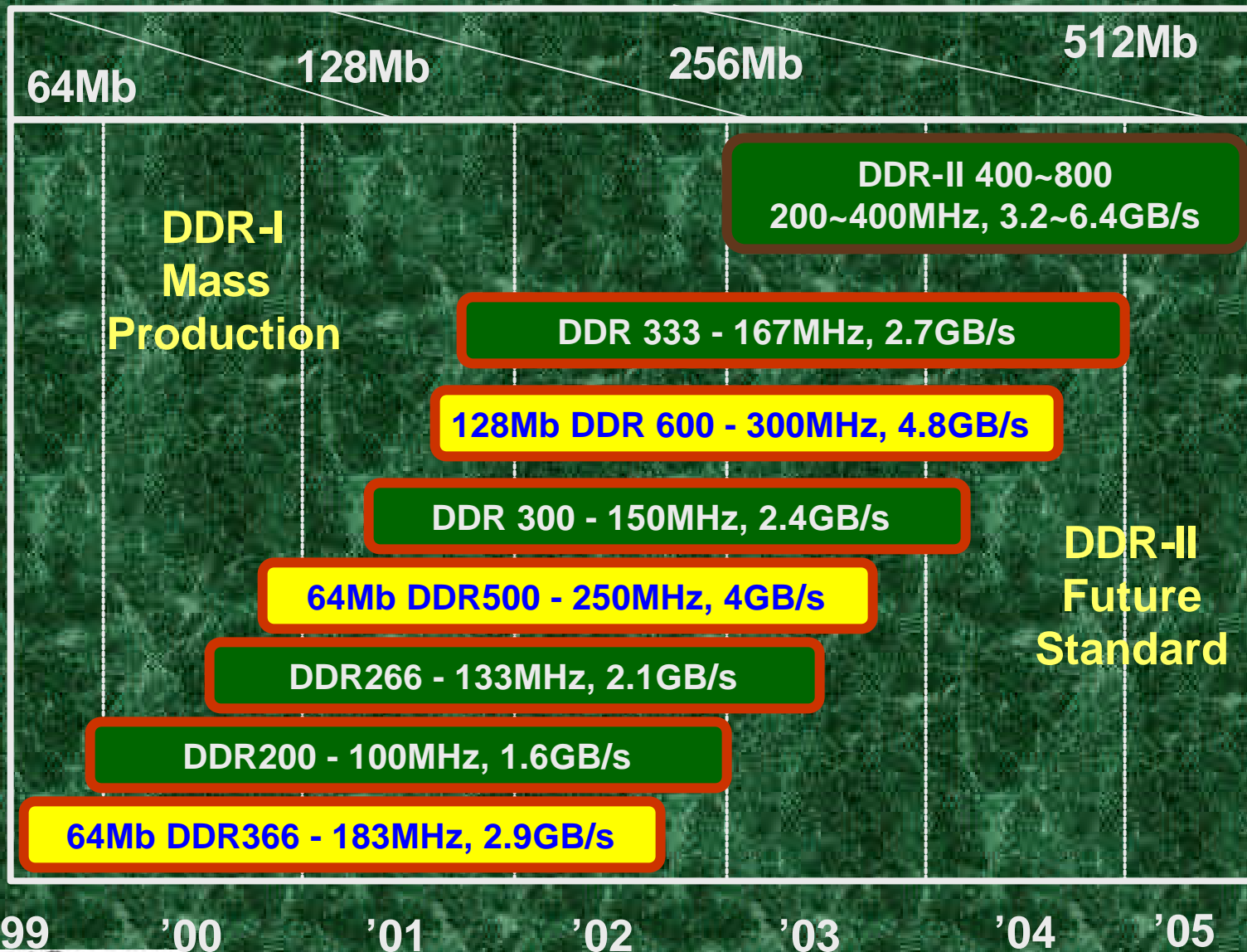
'02

'03

'04

'05

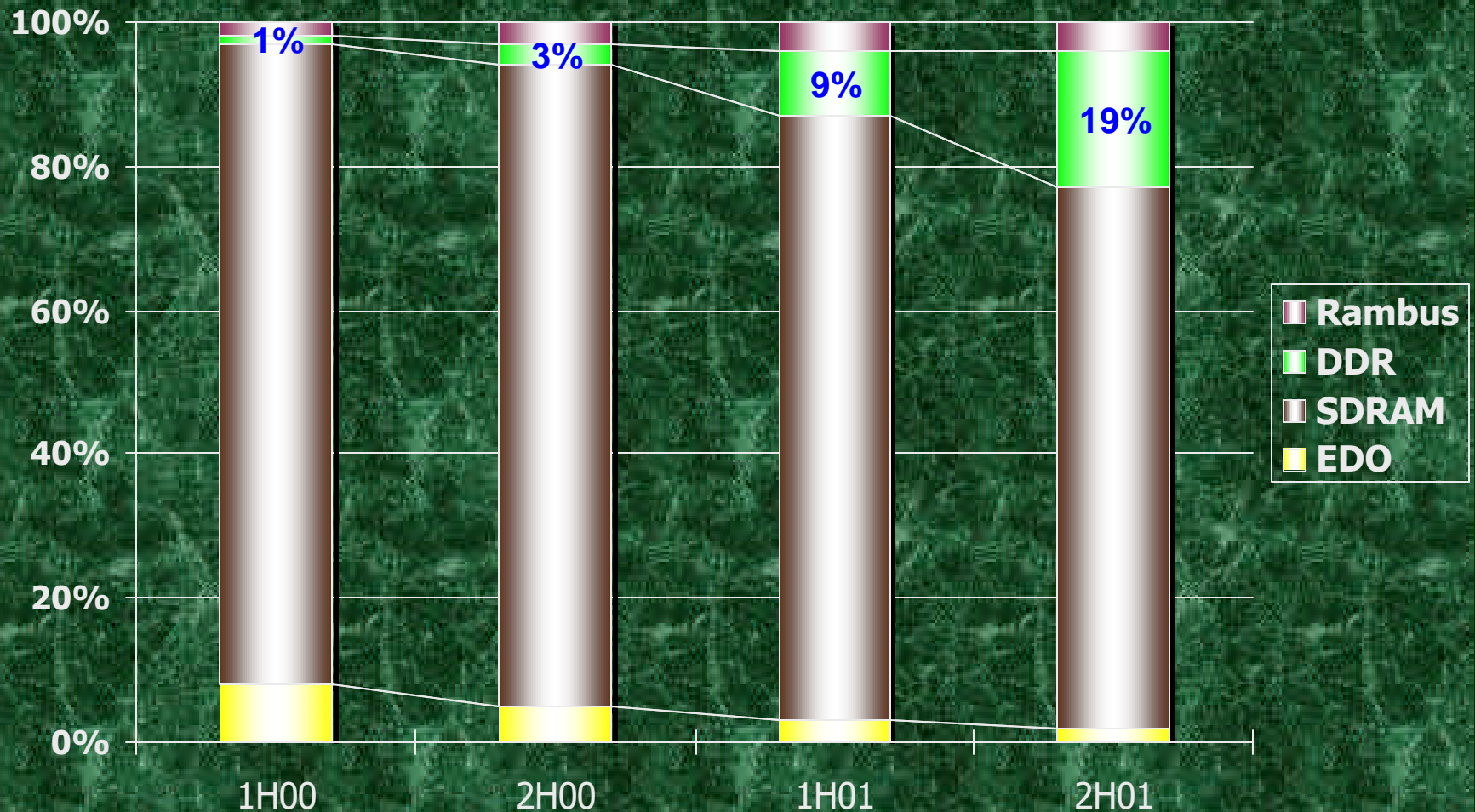
DDR Performance Migration Path



Industry Update

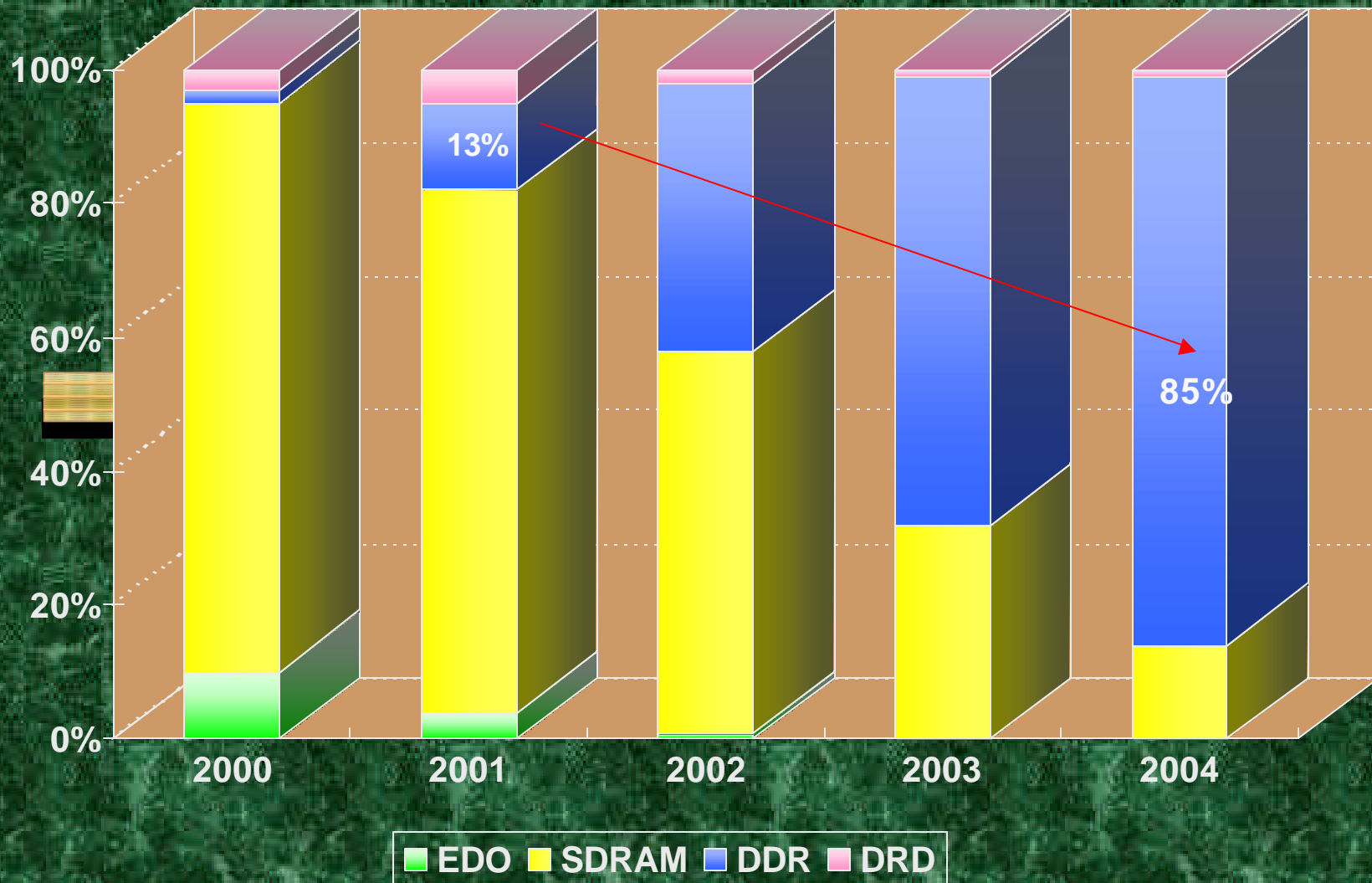
- **DDR Device and DIMM support is ready**
 - **Industry standard specification has been completed by JEDEC**
 - **Component Specification - DDR266A,B and DDR200**
 - **DIMM Specification and common gerber development completed for easy acceptance**
- **DDR Platform is ready**
 - **DDR platform have been fully simulated and physically validated**
 - **Major PC-OEMs have started volume shipment**
 - **DDR is supported by logic chips - PLL, Register and socket is available in market place**
- **Industry Infrastructure is ready for DDR volume shipment**

Short Term DRAM Demand Trend

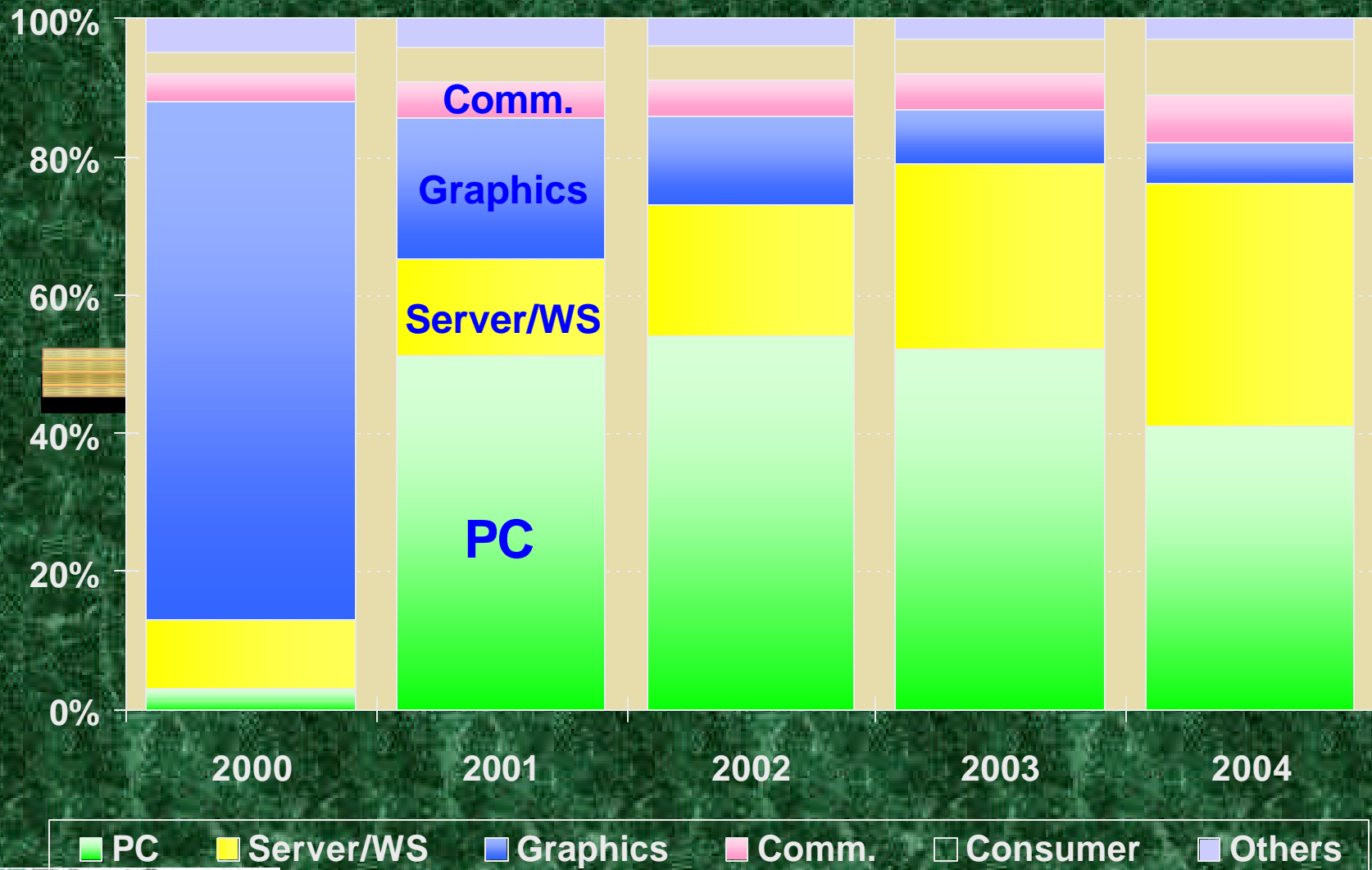


• Compiled from customer surveys
• Courtesy: Hyundai

Long Term DRAM Demand Trend



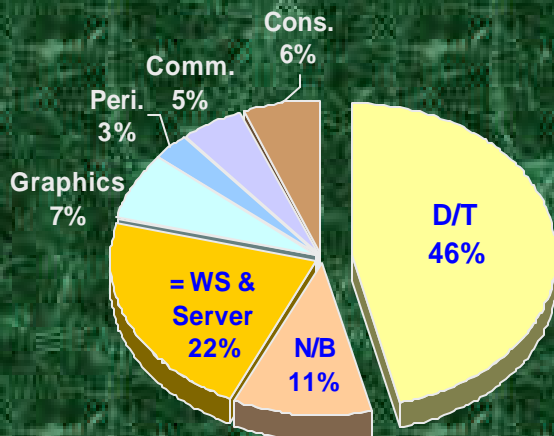
DDR Market Trend by Application



Key Driver For The Next 5 Years

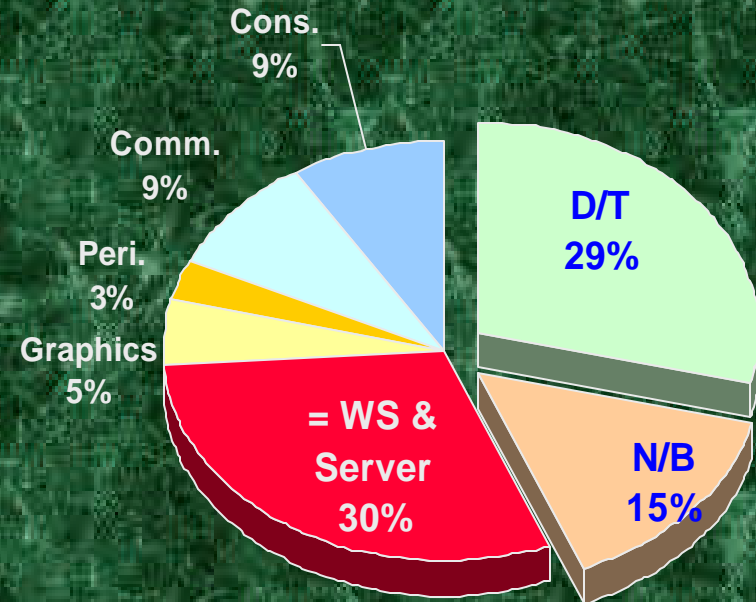
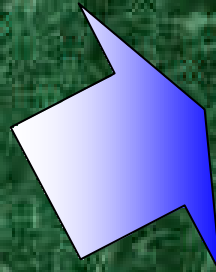
Application		CAGR(00~04)		Key Driver
		System	DRAM bit	
PC	Unit Shipment	15.0%	62%	<ul style="list-style-type: none"> Internet , Low End PC A/Pacific Market (China : CAGR : 26.9%)
	MB/BOX	40%		<ul style="list-style-type: none"> Micro soft Voice recognition
Server		16%	88%	<ul style="list-style-type: none"> Internet, Office network On-line Transition High Performance (MB/BOX)
Game		10%	54%	<ul style="list-style-type: none"> 3D-graphic Virtual reality
Digital Consumer		25%	90%	<ul style="list-style-type: none"> STB/DVD/DSC/D-TV Small Form factor (PDA/Palms)
Communication		-	91%	<ul style="list-style-type: none"> Mobile Internet , Bluetooth IMT2000

DRAM Market Movement



'2000

TAM : 3.8 Bpcs (64M EQ)

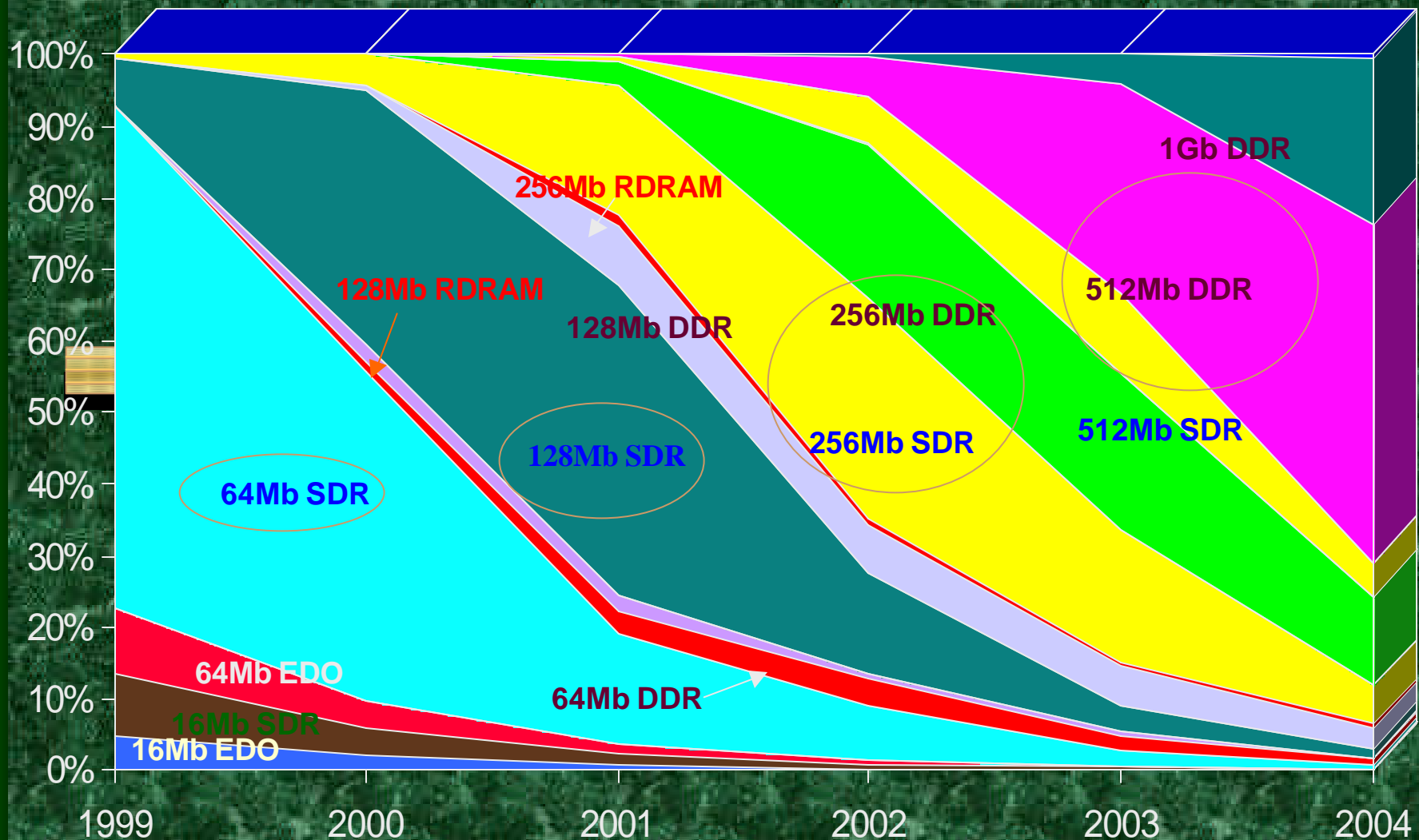


'2004

TAM : 25.9 Bpcs (64M EQ)

< HEI Marketing >

DRAM Transition By Type



Hyundai DDR SDRAM Update

- 128/256M DDR Components
 - 128Mb DDR PC200/PC266B in production
 - 256Mb DDR volume production will start from 4Q00
- DDR DIMM Modules
 - Continue to enable and support industry common gerber
 - Continue to work closely with industry partners such as Chipsets, PC OEMs, and infrastructure companies
 - All Unbuffered & Registered DIMM are available now
 - SO DIMMs are available now
- High Speed - wide I/O DDR Components for point to point applications
 - 4Mx16 DDR 166/183MHz in Mass Production from 1999
200/250MHz, C/S 1Q & Mass Production in 2Q'01
 - 2Mx32 DDR 166/183MHz available and production is ramping up
 - Multiple options/features for high speed interface operation
 - Developing next generation 300MHz 2/4Mx32 DDR

Hyundai DDR Strategy

1999

DDR Graphics Adoption



- World's first company to launch DDR technology
- Support high speed 64Mb DDR in the volume production
 - 4Mx16 / 2Mx32
 - 166~250MHz

2000

Main Memory Enabling

HE UNIX Server, WS

NT PC Server, WS

Desktop PC

Portable PC

- JEDEC TG has defined common gerber for DDR market adoption
- Major focus on validation and enabling activities
- Volume production will start from 2H00

2001 & Beyond

Volume Ramp-up & Expansion of other Application

Consumer

Networking

Others

- Wide range of applications
 - 512Mb for HE main memory application
 - Up to 300MHz for point to point application

Summary

- JEDEC Standard
- High Availability
- High Performance
- High Reliability
- Low Cost
- Low Power Consumption
- DDR Utilizes Existing SDRAM Infrastructure
- DDR works on wide range of applications
- DDR is ready to take off – Many Design Wins

Thank you